



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/090,287	03/01/2002	Peter G. Borden	BOX014 US	6609

34036 7590 03/26/2003

SILICON VALLEY PATENT GROUP LLP
2350 MISSION COLLEGE BOULEVARD
SUITE 360
SANTA CLARA, CA 95054

EXAMINER

VERBITSKY, GAIL KAPLAN

ART UNIT PAPER NUMBER

2859

DATE MAILED: 03/26/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/090,287

Applicant(s)

BORDEN ET AL.

Examiner

Gail Verbitsky

Art Unit

2859

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 March 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claim 1-3, 5-7, 10-13, 14-16, 28-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Smith.

Smith discloses in Figs. 1-4 a device and the method in the field of applicant's endeavor for testing an integrity (defect, flaw, quality, irregular features) of a semiconductor wafer with a conductive structure/ layer/ portion (metal lines and plurality of vias, thus, periodic in space). The device comprises a modulated laser pump (pump beam, electron beam) incident to a surface of the metal lines to evaluate vias. Smith also discloses another laser beam (probe beam) 60, a reflected probe beam is received by a thermal detector 74, the output of the detector is connected to a processor (computer) 76. The output can be imaged by a video camera (imager). The pump beam and the probe beam can be coincident on the sample (col. 1, lines 62-63).

As shown in Fig. 4, the pump beam and the probe beam can be focused at different metal lines (lower) 22 and (upper) 24 respectively. Conduction will be maximum (reference curve, wafer), if there is no flaws, as shown in Fig. 5b. The processor can be programmed to scan a plurality of displaced spots (plurality of measurements) over the

lines on the sample and automatically compare the result with a known wafer pattern (reference wafer). Inherently, the measurements are repeated at different locations of the conductive structure.

For claim 14: Smith describes a semiconductor sample wherein any given a metallized layer (single metal layer) has a pattern of laterally extending (horizontal) conductive lines (traces) (col. 2, lines 43-44).

For claim 15: as shown in Fig. 2, one of the beam can be focused onto a lower line 22, another beam can be focused on an upper line 24 (col. 8, lines 18-30 and col.10, lines 20-21).

With respect to “thereby”, as stated in claims 1, 3: it has been held that the functional “thereby” statement does not define any structure and accordingly can not serve to distinguish. In re Mason, 114 USPQ, 44 937 (1957).

The method steps will be met during the normal operation of the device stated above.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al. (U.S. 5228776) [hereinafter Smith].

Smith discloses in Figs. 1-4 a device in the field of applicant's endeavor for testing an integrity (defect, quality, irregular features) of a semiconductor wafer with a conductive structure/ layer (metal lines and plurality of vias, thus, periodic in space). The device comprises a modulated laser pump (pump beam, electron beam) incident to a surface of the metal lines to evaluate vias. Smith also discloses another laser beam (probe beam) 60, a reflected probe beam is received by a thermal detector 74, the output of the detector is connected to a processor (computer) 76. The output can be imaged by a video camera. The pump beam and the probe beam can be coincident on the sample (col. 1, lines 62-63).

As shown in Fig. 4, the pump beam and the probe beam can be focused at different metal lines (lower) 22 and (upper) 24 respectively. Conduction will be maximum (reference curve, wafer), if there is no flaws, as shown in Fig. 5b. The processor can be programmed to scan a plurality of displaced spots (plurality of measurements) over the lines on the sample and automatically compare the result with a known wafer pattern (reference wafer).

Smith does not disclose the particular dimension of the conductive structure, as claimed by applicant.

With respect to claim 4: the particular dimension of the conductive structure, i.e., 1 micrometer, absent any criticality, is only considered to be the "optimum" dimension of the device disclosed by Smith that a person having ordinary skill in the art would have been able to determine using routine experimentation based among other things, on the desired accuracy of the device, etc. In re Boesch, 205 USPQ 215 (CCPA 1980).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device disclosed by Smith, so as to have a conductive structure less than 1mm, in order to achieve a desirable results.

The method steps will be met during the normal operation of the device stated above.

5. Claim 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith in view of Mitchell et al. (U.S. 6330361) [hereinafter Mitchell].

Smith discloses the device and the method as stated above in paragraph 2.

Smith does not explicitly teach using a transform, as stated in claim 8, and identifying a frequency component, as stated in claim 9.

Mitchell teaches to use a Fourier transform to transform a spatial domain received as a result of plurality of measurements into a frequency domain, so as to obtain the result in a digital form. Inherently, all the data, including those, different from the reference data will be identified as a frequency.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the transform, as taught by Mitchell, for the device and method disclosed by Smith, so as to obtain the result in a digital form, as already suggested by Mitchell, in order to make it easier to process and use the data.

The method steps will be met during the normal operation of the device stated above.

6. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Smith in view of Vanzetti et al. (U.S. 3803413) [hereinafter Vanzetti].

Smith discloses the device and the method as stated above in paragraph 2.

Smith does not disclose that the sample/ conductive structure is positioned on a movable stage.

Vanzetti discloses a system in the field of applicant's endeavor comprising a movable stage to move a device under test (sample) 18 along a first axis. The sample is being continuously scanned.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to add a movable stage, as taught by Vanzetti, to the device and method disclosed by Smith, so as to move the sample in order to allow the user to scan all the surface of the sample.

With respect to "thereby", as stated in claim 17: it has been held that the functional "thereby" statement does not define any structure and accordingly can not serve to distinguish. In re Mason, 114 USPQ, 44 937 (1957).

The method steps will be met during the normal operation of the device stated above.

7. Claims 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith in view of Smith in view of Shakouri et al. (U.S. 20020126732) [hereinafter Shakouri].

Smith discloses the device and the method as stated above in paragraph 2.

Smith does not disclose measuring the phase difference, as stated in claim 18, in a combination with the remaining limitations of claims 18-21.

Shakouri discloses the device and the method in the field of applicant endeavor, wherein a phase difference between an excitation beam (pump beam/ heat source) and a probe (probe beam/ temperature change) is used (inherently measured) to determine a thermal wave propagation through a sample, and thus, inherently, the quality (defect, voids) of the sample.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device disclosed by Smith, so as to measure a phase difference between an excitation beam and a probe, in order to use it to determine a thermal wave propagation through the sample and thus, to determine the sample's quality, as taught by Shakouri.

The method steps will be met during the normal operation of the device stated above.

8. Claims 22-25, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith in view of Rosencwaig (U.S. 4255971).

Smith disclose the device and the method as stated above in paragraph 2.

Smith does not disclose varying the modulation frequency, as stated in claim 22, in a combination with the remaining limitations of claims 22-25,27.

Rosencwaig discloses a device in the field of applicant's endeavor, wherein a temperature dependent output signal is a function of frequency of modulation, and wherein the frequency of modulation is varied so as to provide the full depth profile of a sample (abstract, col. 7, line 64, col. 9, line 44).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the modulating frequency, as taught by Rosencwaig, so as to provide the data of the depth of the sample and thus, its quality. The method steps will be met during the normal operation of the device stated above.

9. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Smith and Rozenywaig in view of Vanzetti.

Smith and Rosencwaig disclose the device and the method as stated above in paragraph 2.

They do not disclose a movable stage, as stated in claim 26.

Vanzetti discloses a system in the field of applicant's endeavor comprising a movable stage to move a device under test (sample) 18 along a first axis. The sample is being continuously scanned.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to add a movable stage, as taught by Vanzetti, to the device and method disclosed by Smith, so as to move the sample in order to allow the user to scan all the surface of the sample.

With respect to "thereby", as stated in claim 26: it has been held that the functional "thereby" statement does not define any structure and accordingly can not serve to distinguish. In re Mason, 114 USPQ, 44 937 (1957).

The method steps will be met during the normal operation of the device stated above.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Conclusion

11. The prior art made of record and not relied upon considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Verbitsky who can be reached at (703) 306-5473 Monday through Friday 7:30 to 4:00 ET.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-5473.

GKV

20 March 2003



Gail Verbitsky, Patent Examiner,
TC 2800